



Discussion Group B: Integrated International Analog

&

Space Collaborative Research Projects



Leverage Collaborations Internationally

INTERNATIONAL SPACE MEDICINE SUMMIT



ISMS Success in Partnership Building

- *Building an International Space Medicine Collaborative legacy:*
 - May 17, 2009
 - International Space Medical Summit
 - Working Group B: GROUND BASED / ANALOG COLLABORATIVE RESEARCH – SUMMARY
- “Tactical recommendation – *Convene an annual international analog workshop – do we need to establish an international space analog network?*”



Congrex

ESA's professional conference organiser

European Space Agency

ESA

Congrex home

20-May-2010

Introduction

Goals of the Workshop

Outline Programme

Abstract Submission

Registration & Accommodation

Programme Committee

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Venue

Workshop on Human Behaviour and Performance in Analogue Environments and Simulations

Programme Committee

A small programme committee is foreseen to aid in the review/selection of abstracts, formulation of the programme, decision of choice of papers for publication.

Programme committee members are:

Oliver Angerer, ESA-ESTEC

Lauren Leveton, NASA

Dietrich Manzey, Berlin Institute of Technology

Jennifer Ngo-Anh, ESA-ESTEC

Elisabeth Rosnet, INSEP

Peter Suedfeld, University of British Columbia

European Space Research & Technology Centre (ESTEC)

- Held adjacent the ISLSWG meeting
 - (International Space Life Science Working Group)

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Workshop Recommendations:

- Conduct series of studies with structured approach, addressing defined questions
- Select analogues according to research question
- Utilization of ISS for increments longer than 6 months
- Require more integration & multidisciplinary in research announcements
- Develop an approach for international cooperation on analogue & simulation activities
- Exchanges like at this WS should be repeated & an overall strategy developed

INTERNATIONAL SPACE MEDICINE SUMMIT



International Collaboration on Analog Utilization Workshop

- Based on the ISMS 2011 Analogs discussion group, it was felt that an International Collaboration on Analog Utilization group was required
- A plan was set in motion to convene an international workshop before the next meeting of the ISMS.
- Based on the extensive discussion from ISMS 2009 & 2010 and the issues and questions raised, an online survey was developed and attendees from the past two ISMS meetings, analog operators, analog experts, agency representatives and space researchers were asked to complete the survey to rank the topics of greatest concern to international collaboration
- Total of 78 people received email notification to respond to the survey.
- We received 33 responses or a 42% return



INTERNATIONAL COLLABORATION ON ANALOG UTILIZATION WORKSHOP



UNIVERSITIES SPACE RESEARCH ASSOCIATION (USRA)

HOUSTON, TEXAS · APRIL 6-8, 2011

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[ORGANIZING COMMITTEE](#)

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ORGANIZING COMMITTEE

Oliver Angerer, MD – *European Space Agency*
Barbara Corbin, PMP – *NASA JSC*
Ronita Cromwell, PhD – *USRA Division of Space Life Sciences*
Lauren Leveton, PhD – *NASA JSC*
Christian Otto, MD – *USRA Division of Space Life Sciences*

PANEL CHAIRS

Panel 1A: Craig Kundrot – *NASA JSC*
Panel 1B: David Dinges, PhD – *University of Pennsylvania*
Panel 2: Rupert Gerzer, Prof. Dr. med. – *German Aerospace Center*
Panel 3: Chiaki Mukai, MD, PhD – *Japan Aerospace Exploration Agency*
Panel 4: Debbie Stapleton – *NASA JSC*
Panel 5: Oliver Angerer, MD – *European Space Agency*
Panel 6: Jeff Sutton, MD, PhD – *National Space Biomedical Research Institute*
Panel 7: Patrik Sundblad, MD, PhD – *European Space Agency*
Panel 8: Kathy Johnson-Throop, PhD – *NASA JSC*

MEETING PLANNING

For questions regarding logistics, contact:

Dagmar Morgan
USRA Division of Space Life Sciences
Phone:  281-244-2009 



- NASA
- Russian Academy of Sciences (RAS)
- Institute for Biomedical Problems (IMBP)
- ESA
- Canadian Space Agency (CSA)
- German Aerospace Center (DLR)
- Japanese Aerospace and Exploration Agency (JAXA)
- Representatives & scientists from various analog environments



Workshop Goals:

1. Develop an international analog collaborative framework
2. Develop strategic milestones within an international collaborative framework
3. Strategize on the use of an analog network in addressing long duration spaceflight human health and performance risks



Panels:

- 1: The Role of Analogs in Addressing the Human Spaceflight Risk
- 2: Analog Operators-Defining the Individual Analogs
- 3: Matching Research Needs with Analog Capabilities
- 4: ISS as an Analog for Future Long Duration Spaceflight Missions
- 5: Effective & Optimal use of Analogs (Agency Reps/Operators/ Users)
- 6: Catalysts & Barriers to International Collaboration (Program Managers/Operators/Users)
- 7: Funding and Access (Agency level/Project level)
- 8: Collecting and Archiving Analog Research Data



Recommendation:

The establishment of an *International Human Life Sciences Space Flight Analog Working Group (IARWG)*.



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- The IARWG will operate within the framework of the International Space Life Sciences Working Group (ISLSWG) and the Joint Working Groups (JWG).
- IARWG will provide a forum to coordinate activities and exchange research information directly related to the cooperative planning and execution of new human life sciences research performed in space flight analog environments, aiming at future application to space.
- Focus on research utilization of facility-class analog environments, with the exception of bed rest facilities.
 - The use of bed rest facilities and animal models are covered by other research working Groups.
- The research focus is key questions with multilateral interest that require the use of an analog environment and provides benefit for all organizations involved.



Specifically, the IARWG will:

- Define problems of interest to all members requiring collaboration in analog environments.
- Define what analogs are best to use for collaborative interests.
- Establish connections with the Expert Group on Human Biology and Medicine within the Scientific Committee on Antarctic Research (SCAR).
- Provide representation at SCAR conferences and facilitate open discussions on utilizing Antarctica as an Analog for space flight.
- Establish life sciences representation in International Space Exploration Coordination Group (ISECG) and their analog working group.
- Define standard measurements that would allow sharing data between analog environments and investigations.



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- Explore development of uniform methods to store, access, and share data generated through such research.
- Communicate the status of each member's current plans and solicitations for using the various analogs.
- Establish a framework to coordinate research campaigns, as appropriate, to minimize duplication of effort and enhance synergy.
- Facilitate interaction between discipline experts in order to have the full benefit of international expertise.
- Organize annual workshops involving a larger group including operators and scientists to share information and results.

Group B Members:

- George Abbey Jr
- Jeannie Becker
- Genie Bopp
- Thomas Borak
- George Brainard
- William Carpentier
- Wu Chunsi
- Barbara Corbin
- Jeremy Curtis
- John Charles
- Vadim Gushin
- Ken Gidlow
- Kathy Johnson-Throop
- Jeff Jones
- Thomas Lang
- Lauren Leveton
- Pascal Lee
- Lauren Leveton
- Saralyn Mark
- Jennifer Needham
- Charles Oman
- Christian Otto
- Neal Pellis
- Marc Reagan
- David Saint-Jacques
- Ulrich Straube
- Chuck Sawin

Analogs

- Ulrich's definition-capability to mimic expected conditions and its effect on the individual
- 2 different analogs: environmental vs operational analogs, besides geography
- Radiation analogs
 - Same with parabolic flight
- People want one place to go to know what does exist out there in terms of analog;

Analogs and the Researchers:

- Need to add characteristics of analogs to the solicitations
- Need not just a list of facilities but also what the facilities can do (what risks can be associated with the analog?)
 - Differences between autonomy/comm delay in NEEMO than in MARs 500
 - Each physical territory belongs to somebody

Role for International Body

- Differences between agencies and how they solicit for analog work (should we have joint or unilateral solicitations?)
 - Important to develop a strategy to how to do this across international agencies to do this
- Difficult to get a “a body” to assign the task to the analog; easier to get agreement on the framework that will allow this collaboration
- Haven’t we done this before? Joint solicitation for experiments; international life sciences research announcement may work for analogs, it works well for spaceflight
- IARWG will focus on mission analogs, not environmental analogs; the IARWG will do both – mission and environment; only thing taken off the table were lab-type analogs, simulations
- IARWG Status: draft charter with agency representatives, agencies are identifying individual representatives – starting to come together, this group will be responsible for finalizing charter
- How do you get the POCs for different analogs access, POCs, database, articles, logistics, etc.? Need for an insider on the analog side to help you with the analog implementation of research studies.

Defining the Research:

- Need to link research questions to analogs
- Human spaceflight risks and gaps should dictate the analogs you use
 - Map the gaps to the analogs and find out how many gaps are addressed by the analogs
- Science driving the analogs requirements:
 - Can you use ISS as an analog to address habitability issues for LDM beyond LEO (could you make a mock-up in ISS?)
- What is the scientific value of the question?
- Historically analogs were not designed to answer research questions; important to identify questions, hypotheses; right answer is scenario dependent (need to constrain the research); need to be aware of analog misuse (interference between studies, piggyback); need to understand what the task is and the best way to get that information; need to take into account the factors characteristics in the analogs such as sandbumps that stop the rover, need to take into account the low fidelity factors that impact your study.

Analogs as a TRL Maturity Process

- Flow of analogs
- Need to prioritize analogs for how we use the analogs (analog capabilities)
- Flow is related to maturing the answer; start the intrnl collaboration in the beginning in order to facilitate
- Not using an analog if existing infrastructure or other facilities exist at labs to address (i.e., answer the questions as cheaply as you can)
 - When does a lab analog or simulation become an analog?
- Use of bldg. 9 for some of this work
- SMEAT was integral to Skylab;

Analog Fidelity

- How do you address the fact that in Mars 500 they are not really going anywhere? How do you compensate for motivation
 - For some it's a career
 - Rewarding, more tasks they do, the more money they get (this is a problem with isolation studies)
 - Follow up to Mars 500 – needs to be more operational, use of virtual reality environments to make it more high fidelity with regard to Mars, shorter
- Risk averse – how much are we willing to take in our use of analogs?
 - » NEEMO had a death
 - » Antarctica has elevated risk
 - » While we wanted a body bag in the medical, it never happened
 - » Exploration is a high risk situation and we have to inform the public
- Since the 60s, Russia took the perspective to work in every environment to get information.
- used analogs to understand what was going on in spaceflight.

Analog to Answer the Habitability Question:

- Right analog for the right question; habitability issues, some can be answered “on campus” – what are the operational impediments for doing this?
 - Deploy early mock-ups, analog flow
 - Did anyone consider IBMP facilities? Other facilities also exist at JSC and elsewhere that can be used.
 - Can we use the international analog working group to steer what needs to be done with habitability? (this would be a good precursor for ISS international collaboration) (this is a good strategy)

Analogues and Team Selection and Training:

- Training for Mars 500 –
 - 4 months (12 candidates); training helped determine the prime crew
 - Can do all the procedures (1000+)
 - Chosen the proper crew, the right stuff
 - New world record coming up, translates into the right training
 - Team interaction and team studies – how we would use the analogues for such studies
- Role of crew training, 10,000 hours rule is important for what emergency situation requires)
- Crew training for a mission; how much time does the crew train together for their missions? How will they train crews together for a Mars mission

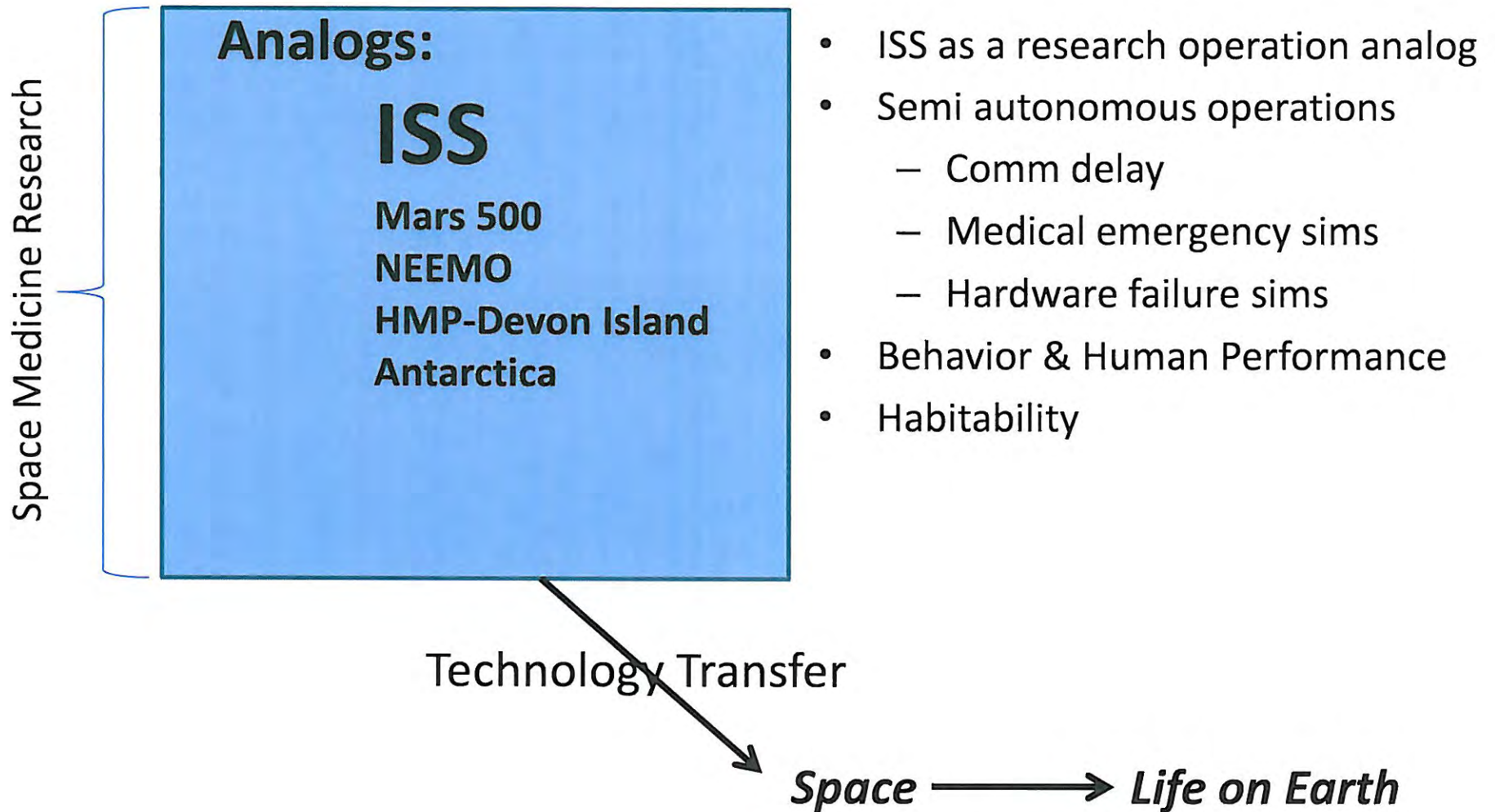
ISS as an analog

- Depends on the question you are asking
 - Outstanding analog if you want 6 months, microgravity, 6 people
 - But very rigidly operated; not a lot of flexibility to address a lot of variables/questions

Analogues for Medical Simulation & Training:

- Medical Simulation Medical evacuation drills, or life support drill during Mars 500, was that done on NEEMO or ISS; need for doing this using analogs; one criteria for analog could be looking at medical emergency procedures and implement in different analogs and calibrate it for exploration – medical place holders
- Mars 500 had a surface activity that involved medical emergency – telemedicine with time delay (big impact on performance)
- Medical simulation, important, translates to improved medical care in real medical events.
- Decision-making opportunities are afforded by expeditions using analogs
- ISS has never to date done a blind drill of such an event; go through the motions on ISS (maybe every 60 days)
- NEEMO has done many medical procedures and research study protocols, including medical drills that were blinded.
- Analogues were instrumental in helping train for medical emergencies

Discussion Topics:



ISS as an Analog-Habitability

- 1) Allocation of space:
 - a. Personal activities (private quarters)
 - i. Distribution of private quarters
 - b. Collective activities (common areas for recreation, dining and exercising;
 - c. Private hygiene area
 - d. Stowage (personal, work, consumables)
- 2) Space needs to be allocated for meaningful work and activities.
- 3) General and individual control over the environment
- 4) Systems to address sensory monotony (cognitive, visual, auditory, tactile, gustatory, olfactory, motor etc.)
- 5) Systems to address social monotony (communication, etc.)
- 6) Crew composition (number, gender, cultural differences, roles, age and experience)
- 7) Physiological and Medical Issues (includes waste management)
- 8) Contingency readiness